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Editorial

Response to Lotz *et al.*: Genetically modified crops and sustainable agriculture: a proposed way forward in the societal debate



I often find myself being labeled as someone who is “for” genetically modified (GM) crops. However, I am not “for” GM crops, without any reservations, nor am I “for” electricity, space technology, computers, or any other science-based technology. I know that every technology has its virtues and its drawbacks, and can be used for good ends and for bad ends. In addition, we can always make mistakes in the applications of new technologies.

But I am “for” the scientific attitude, which involves a critical analysis of the arguments *pro* and *con* a given opinion, and a willingness to change opinion if the evidence becomes strongly in favor of such a shift. Thus, when we say that a given opinion is scientifically based we do not claim that it is true, or that it will remain unchanged forever. But we do claim that it has resulted from a process where the relevant evidence has been taken seriously, and where alternative opinions have been seriously scrutinized and found to be less supported by evidence and theoretical considerations.

So let us have a look at some of the evidence regarding GM crops. First, GM crops have been grown worldwide for more than 15 years, the accumulated acreage during this period being more than one billion hectares. This is an enormous field experiment; yet I am not aware of any substantiated evidence that this has caused any environmental problem that can be attributed to the GM technology *per se*. It is true, as has been pointed out by many critics, that there are emerging problems of glyphosate resistant weeds in areas where glyphosate tolerant GM crops (e.g. corn and soy bean) are grown. Conceivably, this is a consequence of too intensive use of glyphosate, i.e. it is a predictable consequence of a cultivation regime that is not “good agricultural practice”, GAP. Indeed, it is an old experience that if a given herbicide is used year after year in the same area, then resistant weeds will evolve. This is elementary evolutionary theory: resistance will develop whenever a consistent selection pressure (i.e. herbicide treatment) is applied to a weed population, regardless of whether that population is thriving in a field where a GM crop is grown.

The situation is similar to that of pathogens resistant to antibiotics. The biological background is exactly the same – a consistent and strong selection pressure promotes the evolution of resistance. In both cases it is bad routine that should be changed – the cause of the problem is bad medical practice and bad agricultural practice, respectively. Yet, in the anti-GMO propaganda the herbicide, not the farmer, is blamed for the problems with resistant weeds, whereas in the case of resistant pathogens the argument is correctly turned the other way around: it is the medical staff, not the antibiotics, that is blamed.

A second set of evidence is the massive research efforts that have been directed to investigating the possible risks associated with GM crops. There are different figures pertaining to these efforts, but surely the minimum figure is the €200 million spent by DG Research under the Commission in Brussels during the past ten years. In addition, there have been substantial national research efforts in several of the EU member states. The Commission summarizes the results of this research in the following statement: “biotechnology is not *per se* riskier than conventional plant breeding technologies”. The same conclusion is drawn by the review cited by Lotz *et al.*: “The results do not justify *a priori* exclusion of GM technology from the further development of sustainable agriculture”.

A third set of evidence is provided by the procedure for approval of GM crops. Every single GM crop variety is subject to rigorous tests before being grown in the field. I have been responsible for developing the scientific test procedures that are applied in Sweden, and I know that, indeed, these are rigorous. Apparently, Lotz *et al.* are of the same opinion: “. . . GM crops have been checked more thoroughly than any variety released for food and feed purposes in the history of plant breeding. . .”.

Taken together, the scientific evidence is overwhelming: the risk scenarios that were envisaged when the GM technology was new cannot be upheld. Yet, as is well known, the scientifically based recommendations that the European Food Safety Authority (EFSA) deliver as a result of their risk assessments are not followed in the subsequent voting in the Standing Committee for Food and Animal Health of the European Union. My reasons for engaging in the debate about GM crops in Europe are that this is a case where the scientific attitude has taken the back seat – at enormous costs to society. The driver seat is occupied by Greenpeace – a campaign organization where all kinds of arguments seem to be acceptable in order to promote a campaign (scientific arguments are employed if they support the campaign, otherwise not). In the passenger seat beside the driver sit European politicians, who for reasons that are hard to understand, have chosen to listen to Greenpeace and other strong lobbying organizations rather than to the scientific community.

The anti-intellectual low mark regarding GM crops was set by Greenpeace already 15 years ago, when Lord Melchett, then head of Greenpeace, declared to the British House of Lords that “this NGO remains opposed to GM crops regardless of any scientific safety evaluations”. Already at that time, this statement was, of course, an unacceptable insult to the scientific community, to European farmers, and to those seriously interested in environmental issues relating to agriculture. Unfortunately, it comes as no surprise that Greenpeace “remained adamant against the commercial use of GM crops” in the workshops and public debates referred to by Lotz *et al.* This lends further support to the impression that Greenpeace has since long left the domain of intellectual and scientific endeavors.

By doing so, Greenpeace has chosen to play in the same backyards as creationists, vaccination opponents, Jehovah's Witnesses and other groups who are dogmatically denying scientific arguments and evidence.

Why, then, is it that so many still listen to Greenpeace and similar lobbying organizations? We do not generally embark on an argument with a Jehovah's Witness – at least not in scientific terms. We take for granted that his or her resistance to, say, blood transfusion is not scientifically based; therefore we know in advance that it is meaningless to invoke scientific arguments. So why is it not generally realized that Greenpeace's (and other groups') dogmatic resistance to GM crops lacks scientific underpinning? Let me suggest some possible explanations for this strange state-of-affairs.

One is that the green movement has a generally high legitimacy in many European countries. Presumably this legitimacy is a result of both a high degree of environmental consciousness and concern among the general public, and a belief that environmental NGOs such as Greenpeace are working towards good ends, without any hidden agendas or other confounding factors. While this is probably a reasonable assumption for environmental NGOs in general, it is less so for Greenpeace and some other groups. It would be encouraging for the scientific community if the political system would stop to humbly *kowtow* to Greenpeace and other lobbyists, and instead scrutinize their arguments, agendas and goals.

A second conceivable factor is that Greenpeace is not the only organization which has a self interest in opposing GM crops. This holds also for a strong European farmer lobby, for the organic farmers and several other interest groups. When such groups join forces with green parties and general anti-globalists, then a strong lobby results that has managed to push science to the back seat.

A third factor could be the high penetrance of post-modern relativistic thinking in Europe. Too many influential people seem to have adopted the idea that science is just one out of many (equally valid) avenues to acquiring knowledge. Although it is hard to see how such ideas can be applied to the natural sciences – as witnessed

by the unprecedented advances made in science and technology during the last 200 years or so – they are nevertheless permeating much of contemporary thinking. The scientific endeavor certainly has its weaknesses; yet its processes and methodologies are worthy of being defended against various kinds of mumbo-jumbo, e.g. claims that scientific knowledge is established by negotiations, or that the factual content of a piece of scientific knowledge will change, or disappear, if some influential group favors a different view.

Let me conclude by saying that I subscribe to most of the paper by Lotz *et al.* However, I question the idea that a number of NGOs qualify as “stakeholders” regarding issues pertaining to GM crops. I don't think that Greenpeace, nor some other dogmatic opponents to GM crops, qualify as stakeholders, any more than a creationist qualifies as a stakeholder in a scientific discussion of evolutionary theory. These NGOs should be marginalized by being deliberately excluded from any serious, science-based discussion. Since a number of years I personally do precisely that: I refuse to enter into a debate with Greenpeace and other dogmatic GM opponents, because the very moment I accept to do so I also accept to bargain with my conviction that any meaningful discussion of a science-related issue requires a scientific attitude. Dogmatism is incompatible with that attitude.

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